Introduction to Machine Learning

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Abstract— Machine Learning is an area in computer science which involves teaching computers to do things naturally by learning through experience. This means that the computer system is turning data into information to draw meaningful insights from it. In this paper, we will discuss about the significance of Machine Learning and understand how Machine Learning techniques can be used for practical applications.

Keywords –*machine learning, computer science*

I. INTRODUCTION

Data is flowing with huge volume and velocity from different sources such as multimedia, business, financial logs, and social media and so on. Simple Business Intelligence tools are not capable of managing those data. A more advanced tool is required for processing such huge amount of data. With rich data sources, it is important to build models that are capable of solving problems in high-dimensional space.

Machine Learning algorithms derive information from data without the help of any model. Machine Learning belongs to a category of algorithms that allows for more accurate prediction without being explicitly programmed. It is similar to data mining and predictive modeling, especially where all three techniques require searching for patterns and adjusting program actions.

II. TYPES OF MACHINE LEARNING
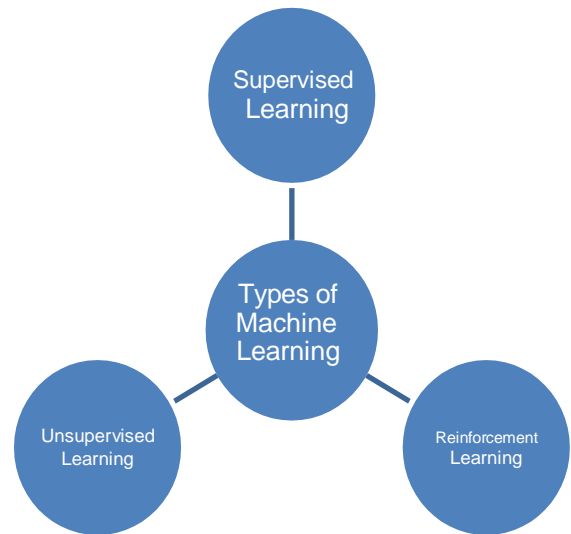
Supervised Learning – In this type of learning, the computer is provided with example inputs that are labeled with their desired outputs. The aim of this method is to make the algorithm to be able to learn by comparing its actual output with the taught outputs to find errors, and modify the model accordingly. Supervised learning therefore uses patterns to predict label values on additional unlabeled data. It is similar to how a teacher teaches his/her students. A common use of supervised learning is to utilize historical data to predict statistically likely future events .All supervised learning techniques are a form of classification or regression.

Supervised Learning Algorithms:

1. Artificial Neural Network – An artificial neural network (ANN) is a methodology for information processing and the method got its inspiration from biological nervous system. Neural networks have the ability to do tasks after learning from experience gained from previous data. ANN is capable of organizing and representing the information it receives from training data. ANN computation can be carried out parallel. Special hardware devices can be designed and manufactured so that we can take advantage of this capability.

2. Regression – In Regression analysis, the system tries to predict the value for an input based on previous information. The most important characteristic of regression are. i)The responses obtained from a model are always quantitative in nature. ii)The model can be constructed only if past data is available. There are two types of regression.

a. Linear regression – Linear regression is a statistical method that allows us to summarize and study the relationship between two continuous variables; the first (regarded as the predictor or independent variable), the second (regarded as the response or the dependent variable).

b. Logistic regression – Logistic algorithm is a binary classification algorithm used when the response variable is dichotomous (1 or 0).

3. Decision Tree – We can predict the class of the output based on the rules generated from the tree structure. The best attribute among the set of input attributes is selected. The algorithm is repeated using training examples associated with each descendent node to select the best attribute to test at that point in the tree.

4. Support Vector Machine - The idea behind SVM is to make use of nonlinear mapping function that transforms data in input space to data in feature space in such a way so as to render a problem linearly separable. The SVMs then automatically discover the optimal separating hyper plane which is nothing but a complex decision surface.

5. Bayesian Classification – Naïve Bayes Classifiers assume that the effect of an attribute value on a given class is independent of the values of the other attributes .This assumption is called as class conditional independence. It is made to simplify the computation involved.

Unsupervised Learning – Unsupervised Learning provides the algorithm with no labeled data in order to allow it to find structure or pattern within its input data. An unlabeled data is more abundant than labeled data; machine learning methods that facilitate unsupervised learning are particularly valuable. Unsupervised learning is commonly used for transactional data. It is found that most unsupervised learning techniques are a form of cluster analysis. In such analysis data is partitioned into groups based on some measure of similarity or shared characteristics.

Unsupervised Learning Algorithm:

1.Clustering – Clustering is the process of grouping together data objects into multiple sets or clusters, so that objects within a cluster have high similarity as

Compared to objects outside of it. The similarity is assessed based on the attributes that describes the objects. Similarity is measured by distance metrics. These algorithms allow us to derive some useful information from the data which was previously unknown. Clustering

is also called as data segmentation because it partitions large datasets into groups according to their similarity.

Reinforcement Learning – Reinforcement learning is an area of machine learning inspired by behaviorist psychology, concerned with how software agents ought to take actions in an environment so as to maximize some notions of cumulative reward. The problem, due to its generality, is studied in many other disciplines, such as game theory, control theory, operations research, information theory, simulation-based optimization, multi-agent system and genetic algorithms.

III. APPLICATION

We are always fascinated by the fact that how Netflix recommends movies we might like. Have you wondered how Google shows you such accurate results? Machine Learning is behind all these technological advances. Much technology today benefit from machine learning. Facial recognition technology allows social media platforms to help users tag and share photos of friends. Recommendation engines, powered by machine learning, suggest what products you should buy based on user preferences. Self driving cars using machine learning to navigate may soon be available to consumers.

Marketing and sales – The purchase pattern is complicated because customers engage in business through a variety of methods. Digital Marketing creates a plethora of customer data that needs to be analyzed and acted upon to improve sales. Insights from the large dataset of sales are required to be collected to develop new strategies to improve the scale. This is where machine learning comes into picture. It uses algorithms to quickly interpret diverse datasets and build correlations. As a result,

Marketing and sales departments are able to analyze the path to purchase and understand how they can prioritize the buyer's experience.

Search Engines – Search engines use machine learning algorithm to find the best personalized match for your query .Google, the world's biggest search engine now offers recommendation and suggestions based on previous user searches using machine learning.

Transportation – Based on travel history and pattern of travelling across various routes, machine learning can help transportation companies predict potential problems that could arise on certain routes, and

Accordingly advise their customers to opt for a different route. Transportation firms like Uber and delivery organizations like Swiggy are increasingly using machine learning technology to carry out data analysis and data modeling to make informed decisions and ease their customers' experience.

IV. RELATED WORK

[1] This paper focuses on the main idea of machine learning and creating attentiveness towards the advancements in technology that evolves and finds its applications in many fields. It shows how machine learning is growing rapidly everywhere and gives a boost to big data analytics and artificial intelligence. Machine learning involves two major tasks that is supervised learning where the program is trained on predefined set of inputs and is able to extract meaningful results when new data is given. The second is unsupervised learning where program is given bunch of data and it has to find patterns by studying relationship among them. Deep learning, an area of machine learning draws its roots from Artificial Neural Network. It is nothing but method to train ANN using small data. If a machine learning algorithm learns to detect the parts of face like eyes, nose, ears then deep learning will enhance the detection by finding the distance between eyes and nose or the length of the nose. Machine Learning and Deep Learning are a small step towards building a machine which can have human-like intelligence.

[2] In this paper, it shows how the modern era of social, mobile, analytic, cloud has given rise to machine learning. The rapid growth of data from different fields is making organizations to adopt machine learning techniques where each interaction, each action performed in the system will enable the system to perform new operations based on the past experience. Machine Learning is a fundamental of Artificial Intelligence which makes a machine to learn on their own.
With the help of machine learning any data science problem can be solved. Before taking a step towards solving a problem, it is necessary to suitably categorize the problem and select the best machine learning algorithm for it. Therefore Machine Learning has been proved as a key technology to derive meaningful information out of the data given.

V. FUTURE SCOPE
Last decade has seen immense growth in the field of artificial intelligence and data science. In today's

Competitive business environment machine learning can be used for real time data processing, for prediction of stock market and for security purpose. The scope of machine learning is not only limited to investment sector but it is also adopted in many areas of healthcare, finance, education, social media, banking ,etc. Today, a concept known as 'Deep Learning' which is a powerful form of machine learning is being used. Based on large quantities of data provided, it helps to construct a mathematical structure called a neural network.

VI. CONCLUSION

By understanding the concept of machine learning it is observed that machine learning is a result of an application of artificial learning. It is merely based on prediction which in turn is made by past experience. There are various algorithms of machine learning which helps the machines to make data driven decisions which is more efficient than explicitly programming for a certain task.

VII. REFERENCES

[1] Simon, Annina & Deo, Mahima & Selvam, Venkatesan & Babu, Ramesh. (2016). An Overview of Machine Learning and its Applications. International Journal of Electrical Sciences & Engineering. Volume. 22-24.

[2] Machine Learning from Theory to Algorithms: An Overview Jafar Alzubi[1], Anand Nayyar[2] and Akshi Kumar[3] Published under licence by IOP Publishing Ltd Journal of Physics: Conference Series, Volume 1142, Second National Conference on Computational Intelligence (NCCI 2018) 5 December 2018, Bangalore, India.

Authors Profile

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